

#### WHAT IS CLAIMED:

1. In a method for separating oil from an oil-water mixture, the improvement comprises:

providing an hydrophobic aerogel that absorbs and separates oil from the oil-water mixture.

2. The improvement of Claim 1, additionally including providing a support for the hydrophobic aerogel.

3. The improvement of Claim 1, additionally including forming the hydrophobic aerogel by incorporation of fluorine therein.

4. The improvement of Claim 3, wherein the incorporation of the fluorine is carried out during aerogel synthesis.

5. The improvement of Claim 3, wherein the incorporation of the fluorine is carried out by applying fluorine vapor to a dried aerogel.

6. The improvement of Claim 3, wherein the incorporation of the fluorine is carried out by the addition of (3, 3, 3-trifluoropropyl)-triethoxysilane during sol-gel processing, and drying under aerogel formation conditions.

7. The improvement of Claim 6, wherein the drying under aerogel formation conditions is carried out by supercritical drying.

8. The improvement of Claim 1, wherein the hydrophobic aerogel is  $\text{CF}_3$  aerogel.

9. The improvement of Claim 1, additionally including forming the hydrophobic aerogel by synthesis incorporating typical sol-gel techniques with the addition of a hydrophobic-type precursor, and drying under aerogel formation conditions.

10. The improvement of Claim 9, wherein the hydrophobic-type precursor is selected from material of the group consisting of (3, 3, 3-trifluoropropyl)-trimethoxysilane and methyl-trimethoxysilane

11. A device that absorbs and separates oil from oil-water mixtures, comprising:

a hydrophobic aerogel, and

a support for the aerogel.

12. The device of Claim 11, wherein said hydrophobic aerogel contains fluorine.

13. The device of Claim 11, wherein said hydrophobic aerogel was made hydrophobic by the addition of fluorine during the sol-gel process for forming the aerogel.

14. The device of Claim 11, wherein said hydrophobic aerogel was made hydrophobic by treating a dried aerogel with fluorine vapor.

15. The device of Claim 1, wherein the hydrophobic aerogel is composed of  $\text{CF}_3$  aerogel.

16. A method of oil spill recovery using materials that absorb, comprising:  
contacting the oil spill with a hydrophobic sol-gel material processed to be

an aerogel,

whereby the hydrophobic aerogel absorbs and retains an oil phase, rejecting a water phase.

17. The method of Claim 16, additionally including providing the hydrophobic aerogel with a support.

18. The method of Claim 16, additionally including forming the hydrophobic aerogel by a sol-gel process which includes the addition of fluorine.

19. The method of Claim 18, additionally including controlling an amount of fluorine added so as to produce a transparent hydrophobic aerogel.

20. The method of Claim 16, wherein the hydrophobic aerogel comprises a  $\text{CF}_3$ -functionalized aerogel.

21. The improvement of Claim 11, wherein the incorporation of the fluorine is carried out by the addition of (3,3,3-trifluoropropyl)-trimethoxysilane during the sol-gel processing and drying under aerogel formation conditions.